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(54) **STAIN RESISTANT FILM CONSTRUCTION**

SCHMUTZABWEISENDE FILMSTRUKTUR

STRUCTURE EN FILMS RESISTANT AUX TACHES

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Description

BACKGROUND OF THE INVENTION

[0001] Flexible film retroreflective products are commonly used as tapes or patches on clothing for safety and decorative purposes. Soft flexible face films, such as polyvinyl chloride or polyurethane, are normally preferred for applications, because they tend to be the least restrictive to the wearer's movement. Under certain conditions, however, these materials can become stained in the laundering process.

SUMMARY OF THE INVENTION

[0002] The invention is a stain resistant film construction product as defined in claim 1 that includes a polyvinyl film laminated to a polyolefin film by an adhesive. The stain resistant film construction is formed into a retroreflective product that includes a polyolefin layer, an adhesive layer and a polyvinyl layer attached to the polyolefin layer by the adhesive layer on the first side of polyvinyl film. A retroreflective layer of prisms is attached to a second side of polyvinyl film. A backing layer may be attached to the retroreflective layer.

[0003] The present invention has the advantage that it provides for a solution for preventing the staining of polyvinyl materials when laundered with stain inducing fabrics.

[0004] WO-A-96 18500 and EP-A-0,711,658 are prior art documents to this application.

[0005] WO-A-00 03875 discloses a product having the features of the preamble of claims 1. The present invention is characterized by the features of the characterizing portion of claim 1. Optional features are recited in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006]

Figure 1 is a cross-sectional view of a first embodiment of a stain resistant film construction

Figure 2 is a cross-sectional view of a second embodiment of the stain resistant film construction.

Figure 3 is a cross-sectional view of a third embodiment of the stain resistant film construction.

Figure 4 is a cross-sectional view of a fourth embodiment of the stain resistant film construction.

[0007] The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the inven-

tion.

DETAILED DESCRIPTION OF THE INVENTION

[0008] The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. All parts and percentages are by weight unless otherwise specified.

[0009] As shown in Figure 1, a layer of a polyolefin film 10, preferably, polyethylene or polypropylene, is attached to a surface of a polyvinyl film 12 in order to form a barrier to a staining component of a fabric. A thin polyolefin film having a thickness that is sufficiently flexible to minimize the loss of desired softness and elongation in the product while maintaining a sufficient barrier. The preferred range of thickness is between about 6 and 125 micrometers. A more preferred thickness is between 10 and 40 micrometers. Preferred polyolefins include polyethylene, polypropylene, polybutylene, polybutenes, polyisoprene and copolymers thereof. The polyolefin film 10 can be attached to the polyvinyl film 12 by an adhesive 14. Polyolefin film 10 can be attached with an adhesive 14, such as a urethane adhesive, an ultraviolet light curing adhesive, a water-based adhesive or a solvent based adhesive, and a hot melt adhesive.

[0010] Polyvinyl sheeting product 20, which is a retroreflective sheeting, is shown in Figure 2. Polyvinyl sheeting product 20 has polyvinyl sheeting 22, which is formed from vinyl units. Examples of suitable materials include polyvinyl chloride, polyvinyl fluoride, polyvinylidene fluoride, and polyvinylidene chloride. The polyvinyl sheeting 22 can have plasticizers within the polyvinyl to allow flexibility and softness to the product. A preferred polyvinyl sheeting product is polyvinyl chloride. These plasticizers can leach from the polyvinyl film. When laundered, the plasticizers of the polyvinyl sheeting can react with numerous dyes that are present in the laundry water from other clothing articles that are washed at the same time. For example, the dyes from blue jeans can readily stain a polyvinyl sheeting during a laundering cycle. As a way of avoiding or minimizing staining, polyolefin film 24 is laminated or by other means attached to the layer of polyvinyl sheeting 22. Preferably the films are laminated at a temperature as warm as possible without deforming the film. Polyolefin film 24 can be attached with an adhesive 26, such as a urethane adhesive, an ultraviolet light curing adhesive, a water-based adhesive, a solvent based adhesive, and a hot melt adhesive. A preferred polyolefin is available from Mobil Chemical Company under the name of Bicolor. It is a co-extruded polypropylene film with an acrylic top coat or layer and surface treatment to promote lamination or

print adhesion. In one embodiment, suitable polyvinyl sheeting is in the range of between 50 and 508 micrometers (two and twenty mils) in thickness. In a preferred embodiment, the polyvinyl material is between 152 and 254 micrometers (six and ten mils) in thickness.

[0011] Cast on the second side of the polyvinyl sheeting are prisms 28 that can be attached by methods known in the art including U.S. Patent 3,684,348, issued to Rowland on August 15, 1972 and U.S. Patent 3,689,346, issued to Rowland on September 5, 1972. For example, the prisms 28 can include polyvinyl. Prisms can also be formed of hard materials, such as polyurethane, polycarbonate or polyacrylate. The prisms can be attached to the polyvinyl film by a suitable method, such as described in U.S. Application No. 08/976,095, filed on November 21, 1997, now issued as U.S. Patent 6,039,909 on March 21, 2000, which corresponds to International Publication WO96/36480, published on November 21, 1996. The prisms that are attached to the polyvinyl film are typically cube corner prisms but can also include linear prisms. In one embodiment, the cube-corner prisms can have a pitch in a range of between 38 and 254 micrometers (1.5 and ten mils). In a preferred embodiment, the cube-corner prisms can have a pitch in a range of between 76 to 152 micrometers (three and six mils).

[0012] In another embodiment, as shown in Figure 3, a polyvinyl backing layer or other suitable backing layer can be welded by radio frequency welding or other suitable methods to form air spaces 32 between polyvinyl sheeting and a backing layer 30 with prisms 28 attached to a side of polyvinyl within the air spaces 32 to form air-backed prisms.

[0013] In yet another embodiment, as shown in Figure 4, the prisms are coated to form a metalized layer 34 with a reflective material, such as aluminum, silver or gold, and then laminated to a suitable backing layer 38, such as a polymer film or a cloth, with a pressure sensitive adhesive or a heat activated adhesive. This laminate can be sewn onto a garment. In yet another embodiment, the laminate can be attached to the garment directly using the pressure sensitive adhesive or the heat activated adhesive.

Example 1

[0014] A laminate of Mobil Bicolor polypropylene film was laminated to a clear polyvinyl film and attached with a PN 03 polyurethane adhesive from Morton Chemical. On the polyvinyl side of the laminate acrylic prisms were cast and a soft white polyvinyl chloride backing film was radio frequency sealed to the prisms in first polyvinyl layer. The samples were washed with Clorox Sani-Bleach dyed polyester cotton fabric at 68°C (155°F) for twenty-five minutes. A standard Reflexite polyvinyl tape product, Product No. GP330, was also included as a control. The polypropylene-faced tape showed no staining ($\Delta E < 8$) while the normal Reflexite polyvinyl tape product

was very blue in color ($\Delta E > 27$).

Example 2

[0015] A polyvinyl chloride film (approximately 254 micrometers (10 mils thick)) was coated with a layer of Bostik 7063 solvent adhesive crosslinked with Boscodur 16 (Both from Bostik Corp.). The solvent was evaporated and a 25 micrometers (one mil) thick layer of Mobil Bicolor LBW was laminated to the adhesive surface. Retroreflective cube corners were cast onto the other side of the polyvinyl chloride and the structure was radio frequency sealed to a second layer of polyvinyl chloride to form air pockets around the retroreflective cube corners.

Example 3

[0016] Vinyl film was coated with a ultraviolet curable composition of Sartomer SR981 and SR963 (Sartomer Corp.) with suitable photoinitiators. A 30.5 micrometers (1.2 mil layer) of Mobil Bicolor LBW was laminated to the coating and the material was cured with ultraviolet light. A retroreflective multilayer tape product was made with this laminate in the same fashion as Example 1.

Example 4

[0017] A comparative example of the retroreflective tape was made by the same method as used in Example 2, except that the layer of Mobil Bicolor was not laminated to the surface. This material was used for the laundering tests in order to evaluate the effectiveness of the added polyolefin layer.

[0018] While this invention has been particularly shown and described with references to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention encompassed by the appended claims.

Claims

1. A product comprising:

- a) a polyolefin layer (10);
- b) an adhesive layer (14);
- c) a polyvinyl layer (12) which has a first side and a second side and said polyvinyl layer is attached to said polyolefin layer by said adhesive on said first side of the polyvinyl layer, the product being **characterized by:**

a retroreflective layer of prisms attached to said second side of the polyvinyl layer and by being stain resistant.

2. A stain resistant product of claim 1 including a back-

ing layer (30) attached to the retroreflective layer (28) wherein said retroreflective layer (28) is between the backing layer and the polyvinyl layer.

3. A stain resistant product of claim 1 or 2, wherein said retroreflective layer (28) includes cube-corner prisms. 5
4. A stain resistant product of any one of claims 1 to 3, wherein said retroreflective layer includes a metallized layer (34). 10
5. A stain resistant product of claim 4, wherein said metallized layer (34) includes a metal selected from a group consisting of aluminium, silver and gold. 15
6. A stain resistant product of claim 1, wherein either:
 - a) the polyvinyl film (12) is selected from a group consisting of polyvinyl chloride, polyvinyl fluoride, polyvinylidene fluoride, and polyvinylidene chloride; 20
 - b) wherein the backing layer (38) includes a fabric; or
 - c) wherein the backing layer (38) includes a polymer film. 25
7. A stain resistant product of claim 4 wherein a heat activated adhesive layer is on the metallized layer (34), and, optionally, wherein the backing layer (38) includes a fabric that is attached to the heat activated adhesive layer. 30
8. A stain resistant product of claim 4, wherein a pressure sensitive adhesive layer is on the metallized layer (34), and, optionally, wherein the backing layer (38) includes a fabric that is attached to the pressure sensitive adhesive layer. 40
9. A stain resistant product of claim 1, wherein either:
 - a) the polyolefin film (10) is selected from a group consisting of polyethylene, polypropylene, polybutylene, polybutene, polyisoprene and copolymers thereof; or 45
 - b) wherein an adhesive (14) in the adhesive layer is selected from a group consisting of a urethane adhesive, an ultraviolet light curing adhesive, a water-based adhesive, a solvent based adhesive, and a hot melt adhesive 50
10. A garment to which is attached a stain resistant product of any preceding claim. 55

Patentansprüche

1. Ein Produkt enthaltend :

- a) eine Polyolefinschicht (10);
- b) eine Klebeschicht (14);
- c) eine Polyvinylschicht (12) die eine erste und eine zweite Seite hat, und

wobei die Polyvinylschicht über den Kleber auf der ersten Seite der Polyvinylschicht an der Polyolefinschicht befestigt ist, wobei das Produkt durch eine retroreflektierende Schicht von Prismen gekennzeichnet ist, die an der zweiten Seite der Polyvinylschicht befestigt ist und fleckenresistent ist.

2. Ein fleckenresistentes Produkt nach Anspruch 1, welches eine Unterschicht (30) beinhaltet, die an der retroreflektierenden Schicht (28) befestigt ist, wobei die retroreflektierende Schicht (28) zwischen der Unterschicht und der Polyvinylschicht ist.
3. Ein fleckenresistentes Produkt nach Anspruch 1 oder 2 wobei die retroreflektierende Schicht (28) Würfel- Ecken- Prismen (cube-corner prisms) beinhaltet.
4. Ein fleckenresistentes Produkt gemäß irgendeinem der Ansprüche 1 bis 3, wobei die retroreflektierende Schicht eine metallisierte Schicht (34) beinhaltet.
5. Ein fleckenresistentes Produkt nach Anspruch 4, wobei die metallisierte Schicht (34) Aluminium, Silber oder Gold als Metall beinhaltet.
6. Ein fleckenresistentes Produkt nach Anspruch 1, wobei entweder:
 - a) der Polyvinylfilm (12) Polyvinylchlorid, Polyvinylfluorid, Polyvinylidenfluorid oder Polyvinylidenchlorid ist;
 - b) wobei die Unterschicht (38) ein Gewebe beinhaltet oder
 - c) wobei die Unterschicht (38) einen Polymerfilm beinhaltet.
7. Ein fleckenresistentes Produkt nach Anspruch 4, wobei eine wärmeaktivierte Klebeschicht auf der metallisierten Schicht (34) ist und gegebenenfalls wobei die Unterschicht (38) ein Gewebe beinhaltet, das an der wärmeaktivierten Klebeschicht befestigt ist.
8. Ein fleckenresistentes Produkt nach Anspruch 4, wobei eine druckempfindliche Klebeschicht auf der metallisierten Schicht (34) ist und gegebenenfalls wobei die Unterschicht (38) ein Gewebe beinhaltet, das an der druckempfindlichen Klebeschicht befe-

stigt ist.

9. Ein fleckenresistentes Produkt nach Anspruch 1, wobei entweder:

a) der Polymerfilm (10) Polyethylen, Polypropylen, Polybutylen, Polybuten, Polyisopren oder ein Copolymer davon ist oder
b) wobei ein Kleber (14) in der Klebeschicht ein Urethankleber, ein Ultraviolettlicht aushärtender Kleber, ein wasserbasierender Kleber, ein Lösungsmittelbasierender Kleber oder ein Heißkleber ist.

10. Kleidungsstück, an welchem ein fleckenresistentes Produkt gemäß irgendeinem der vorangehenden Ansprüche befestigt ist.

Revendications

1. Produit comprenant :

a) une couche de polyoléfine (10);
b) une couche d'adhésif (14);
c) une couche de résine polyvinylique (12) comportant une première face et une deuxième face, et ladite couche de résine polyvinylique est liée à ladite couche de polyoléfine par ledit adhésif sur ladite première face de la couche de résine polyvinylique, le produit étant **caractérisé par** :

une couche de prismes rétro réfléchissante liée à ladite deuxième face de la couche de résine polyvinylique et résistante aux taches.

2. Produit résistant aux tâches selon la revendication 1, comprenant une couche support (30) liée à la couche rétro réfléchissante (28), dans lequel ladite couche rétro réfléchissante (28) est entre la couche support et la couche de résine polyvinylique.

3. Produit résistant aux tâches selon la revendication 1 ou 2, dans lequel ladite couche rétro réfléchissante (28) comprend des prismes à coins cubiques.

4. Produit résistant aux tâches selon l'une quelconque des revendications 1 à 3, dans lequel ladite couche rétro réfléchissante comprend une couche métallique (34).

5. Produit résistant aux tâches selon la revendication 4, dans lequel ladite couche métallique (34) comprend un métal choisi parmi le groupe consistant en l'aluminium, l'argent et l'or.

6. Produit résistant aux tâches selon la revendication 1, dans lequel soit

a) le film de résine polyvinylique (12) est choisi parmi le groupe consistant en le chlorure de polyvinyle, le fluorure de polyvinyle, le fluorure de polyvinylidène et le chlorure de polyvinylidène ;
b) la couche support (38) comprend un tissu ;
ou
c) la couche support (38) comprend un film de polymère.

7. Produit résistant aux tâches selon la revendication 4, dans lequel une couche d'adhésif thermoactivable est prévue sur la couche métallique (34), et éventuellement, dans lequel la couche support (38) comprend un tissu qui est lié à la couche d'adhésif thermoactivable.

8. Produit résistant aux tâches selon la revendication 4, dans lequel une couche d'adhésif sensible à la pression est prévue sur la couche métallique (34), et éventuellement, dans lequel la couche support (38) comprend un tissu qui est lié à la couche d'adhésif sensible à la pression.

9. Produit résistant aux tâches selon la revendication 1, dans lequel soit

a) le film de polyoléfine (10) est choisi parmi le groupe consistant en le polyéthylène, le polypropylène, le polybutylène, le polybutène, le polyisoprène, et leurs copolymères ;
ou
b) l'adhésif (14) dans la couche d'adhésif est choisi parmi le groupe consistant en un adhésif de type uréthane, un adhésif durcissant à la lumière ultraviolette, un adhésif à base d'eau, un adhésif à base de solvant et un adhésif thermofusible.

10. Vêtement auquel est lié un produit résistant aux tâches selon l'une quelconque des revendications précédentes.

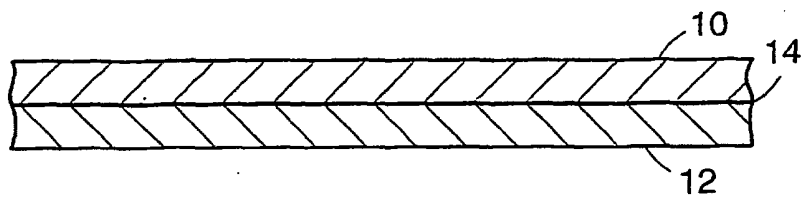


FIG. 1

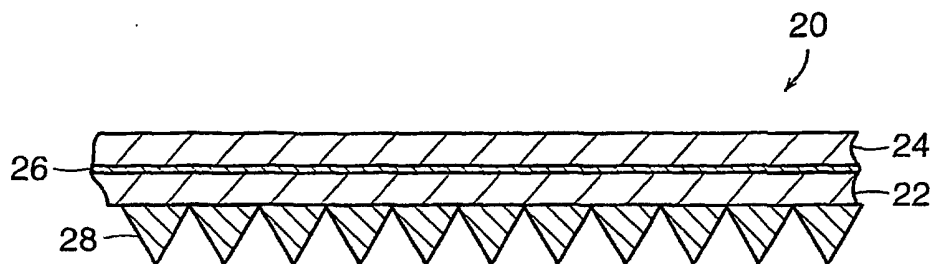


FIG. 2

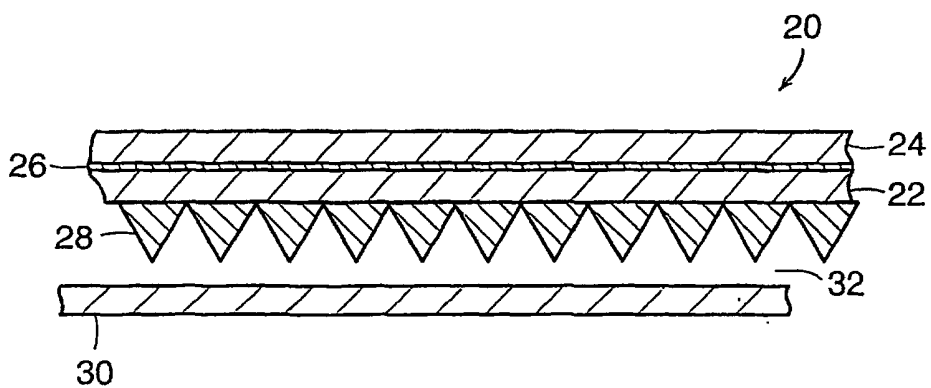


FIG. 3

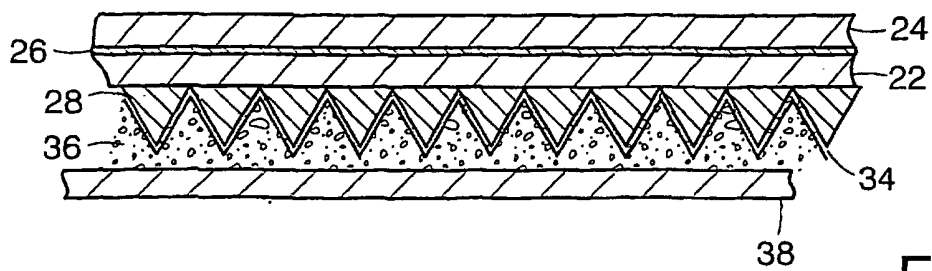


FIG. 4